Climate Change Impacts on Water Operations and Ecological Processes in California

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Public Comments

No public comments were received for this proposal.

Initial Selection Panel Review

Proposal Title

#0242: Climate Change Impacts on Water Operations and Ecological Processes in California

Funding:

Do not fund

Initial Selection Panel (Primary) Review

Topic Areas

- Direct And Indirect Effects Of Diversions On At−risk Species
- Implications Of Future Change On Regional Hydrology, Water Operations, And Environmental Processes
- Water Management Models For Prediction, Optimization, And Strategic Assessments
- Salmonid−related Projects

Please describe the relevance and strategic importance of this proposal in the context of this PSP. How does the proposal address the topic areas identified above? What are the broader CALFED Goals this proposal may meet that are not accounted for in these specific topic areas?

This project builds on an existing model for the Sacramento area and extends it to the entire Central Valley with an integrated water system. The idea is to create an integrated hydrology/water operations model, indicating temperature and streamflow changes under various climate and usage scenarios [including land, supply and demand]. A significant economic component will be added as well. A linkage to impact on at−risk species [salmoid] is made, but reviewers raise issues about the potential for this. The potential for major impact on water management and operations and implications of future changes in processes is high, but some reviewers think there is some risk that this proposal overreaches from the current state of the art. However, the proposed collaborations are tested and seem to provide a powerful team.

The budgets of proposals submitted in response to this PSP are larger, on average, than those submitted to CALFED in previous years. The Science Program is committed to getting as much science per dollar as is reasonably possible. With this commitment in mind, can the proposed budget be streamlined? If so, please recommend and clearly justify a new budget total in the space provided.

The budget seems reasonable; indeed, reviewers question whether there is enough person−power to pull this off in three years. No reduction is recommended.

Evaluation Summary And Rating.

Provide a brief explanation of your summary rating and any additional comments you feel are pertinent.

There is general agreement that this is a significant project and that its main strategy and goals are very important. There is less agreement on whether or not this is yet the time to attempt the whole valley approach. At least one reviewer suggests that one should build up step−by−step and not undertake the whole thing at once. I am inclined to think that this project might be delayed profitably given the support for the Sacramento Valley project already in the investigators hands. When that project has been proven out, this one could be refined; review questions answered, and then the whole Central Valley tackled. It should be noted that the investigators regard this as an additional tool for decision makers − not one to replace, but rather a counterpoint to, e.g., CALVIN.

Selection Panel (Discussion) Review

fund this amount: $**0**
note:
do not fund

This proposal would develop an integrated Bay−Delta system hydrology/water operations tool for decision−makers that does not exist currently. We are now actively making the kinds of tradeoffs this model is meant to analyze, but in an ad hoc way

without such a tool. However, it is not clear that models that attempt this kind of integration will be successful at doing the analysis they aim to do and become a useful tool. There is some overlap with proposal #84; the socio-economic analysis is one of the key differences.

This project builds on an EPA-funded project for the Sacramento area, and a CEC-funded project for economic analysis of climate change and adaptation. The Panel suggests to hold off funding this project until the CEC and EPA projects are finished as proof of concept.

Panel Ranking: Do not fund.

Collaboration Panel Review

Proposal Title

#0242: Climate Change Impacts on Water Operations and Ecological Processes in California

Final Panel Rating
adequate

Collaboration Panel (Primary) Review

Collaboration:

Will the results of the collaborative effort be greater than the sum of its parts? Is it clear why the subprojects are part of a larger collaborative proposal rather than several independent smaller ones?

adequate
The proposal incorporates an existing model and staff who have previously collaborated on the development of that model. Staff from the two major entities involved in this project – UC Berkeley and NHI – have unique expertise and capabilities required for the project. There is minimal discussion on the nature of the collaboration identified in the Tasks and Personnel forms, and is virtually ignored in the Project Workplan text (pages 15–19)

Interdependence And Integration:

Does the proposal have an example that clearly articulates the conceptual model of each subproject and how they link together as a whole? Are the boundaries of the study plans focused and cohesive, yet well delineated? Is there a plan for potential differences in the stages of subproject completion times? Are there clear plans for analyses and interpretations which seek to identify and quantify relationships among the data collected in various subprojects rather than separate analyses for each subproject?

adequate
No conceptual model is presented that links the tasks. The only conceptual model presented (page 9) depicts type waterseds. The project tasks are distinguished, but the

details of the activities to be performed are unnecessarily brief and lack specific descriptions of the work. Descriptions of the individual responsibilities of the workers are lareley ignored in the Project Workplan text (pages 15−19); they are lumped together in the Tasks and Personnel forms, but typically particular duties are not identified per each sub−task participant.

Project Management:

Is it clear who will be performing management tasks and administration of the project? Are there resources set aside for project management and time given for investigators to collaborate? Is there a process for making decisions during the course of the project? Are there acknowledgments of potential barriers to collaboration and explanations of how team members will overcome barriers particular to their institutions?

inadequate
The level of authority between the Lead Investigator and the three−person management team is not distinguished. There are no dedicated funds or specific personnel assigned to collaboration−type activities; the Budget form includes only 180 hours for project management over the 2−year period of the project.

Team Composition:

Does the lead principal investigator have successful management history and experience leading collaborative teams? Is it clear that all key personnel are committed to making significant contributions to the project? Do team members have complementary skills?

adequate
There is no evidence presented that the Lead Investigator has experience in leading a comparable collaborative effort. The individual responsibilities of the participants are not clearly definded for several tasks − instead, names of sub−task participants are lumped together within a sub−task on the Personnel and Task forms. Several participants have previously worked on similar efforts involving WEAP.

Communication Of Results:

Is there a clear plan for comprehensive and cohesive reporting of project progress to the CALFED community?

inadequate
The plan to report progress is vague, limited to two sentences in the Project Workplan (page 19) and a brief description on page 4 of the Tasks form. The work identified in the Budget form for communication of results is 80 hours combined for two of the three participants onthe mangemtn team over the 2-year duration of the proposal.

Additional Comments:

Collaboration Panel (Discussion) Review

Primary and secondary reviewers concurred in all rating categories that proposal was adequate. They agreed that the proposal suffered from lack of detail.

Technical Synthesis Panel Review

Proposal Title

#0242: Climate Change Impacts on Water Operations and Ecological Processes in California

Final Panel Rating
above average

Technical Synthesis Panel (Primary) Review

TSP Primary Reviewer's Evaluation Summary And Rating:

By building on an existing modeling framework (WEAP), a new integrated hydrology/water operations model of the Central Valley, capable of assessing implications of likely shifts in climate, population growth, economic development, and changes in land use, will be developed. In addition to expanding the geographic range of the model to include the Delta and Central Valley river systems, the proposed work will include a means of estimating changes to river water temperatures. The relation of this effort to operations and other models needs further elaboration. Quantitative procedures to evaluate the model are not provided. The team is top heavy with too many chiefs and only two graduate students, who seem to have most of the work, hence, it is rather expensive.

Additional Comments:

Several issues were raised by external reviewers: What is the uncertainty cascade that will propagate through the following sequence of the integrated model: Global Climate Model Temperature (200–300km scale resolution)-->Downscaling to a mountainous watershed snowpack (5–10 km) ---> Point Temperature Index Model for Melt ---> Recharge/discharge dynamics to stream ---> Stream Flow Volume + Downscaled Air Temperature ---> Derived Stream Temperature. At each step

there are significant uncertainties and unresolved physics. One could pick just one component, e.g., the temperature index snowmelt model, and critically evaluate the significant errors and uncertainties that result in the melt estimates that are not modeling the full radiative balance. Projects of this variety need to start from sub−models and do an ensemble, multi−model study of the uncertainties, sensitivities on a subsystem basis, before launching into integrated work. Can a decision maker look at WEAP model output, understand the uncertainties, weigh the relative contribution of sources of forcing, scale uncertainty and act. The reviewers are skeptical. Generating usable knowledge is a central issue for programs like CALFED, wherein the import of adaptive management has been clearly articulated and acknowledged. For example, how will the model outputs and scenarios be connected to salmonid life history and production.

By building on an existing modeling framework (WEAP), a new integrated hydrology/water operations model of the Central Valley, capable of assessing implications of likely shifts in climate, population growth, economic development, and changes in land use, will be developed. In addition to expanding the geographic range of the model to include the Delta and Central Valley river systems, the proposed work will include a means of estimating changes to river water temperatures. The relation of this effort to operations and other models needs further elaboration. Quantitative procedures to evaluate the model are not provided. The team is top heavy with too many chiefs and only two graduate students, who seem to have most of the work, hence, it is rather expensive.

Technical Synthesis Panel (Discussion) Review

TSP Observations, Findings And Recommendations:

This proposal addresses issues of critical importance to CBDA. It is well−written, comes from a qualified project team, and expands on existing models that have real promise. It integrates physical and climate models with a socio−economic component; the latter aspect of the research is missing from

similar proposals in this PSP pool and this was considered the proposal's main strength.

The external reviewers were concerned that the applicants have not addressed how they will attack the difficulties involved with validating and evaluating uncertainty in a cascading series of physical models. How, exactly, will climate scenarios be incorporated into the final products? It might be argued that the external reviewers focused too much on the details and missed the "big picture" that this model hopes to address. However, the panel felt that surmounting these technical difficulties would be central to the success of the project.

Also, there was no description of how the project proponents will incorporate model uncertainty into their products. The panel urges the applicants to develop explicit methods for evaluating and incorporating model uncertainty.

The nexus between the models and biology is the prediction of stream temperature response and how this will impact salmon populations. The panel notes that stream temperatures are important factor in production of juvenile salmonids (but it becomes relatively less important in latter life stages of salmonid life−history); and that future models will require additional physical variables related to salmonid production

The panel noted that project success will require ACTIVE involvement of all project PIs (in addition to their graduate students). The panel endorsed the modeling approach, the capabilities of the team and the importance of the modeling topic. The results of such an appropriately−modified and managed project will be of high value to researchers and managers in the CBDA solution−area and beyond.

Rating: Above average

Technical Review #1

proposal title: Climate Change Impacts on Water Operations and Ecological Processes in California

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals and objectives are clearly stated. I commend the PIs effort in anticipating and addressing the questions regarding the need for a WEAP−like framework, especially in the face of existing set of models (some less, others more intgrated).** **In my view, the hypotheses for the project appear to the less well−articulated. Numerous motivating factors, CALFED needs/goals provide impetus for work of the proposed variety, however, recognizing that ultimately, the overarching science questions must be addressed in a adaptive fashion, I have some concerns regarding the usability of the science results from the project−−exactly what new body of knowledge can be generated by this exercise that can be assessed as more accurate and representative (than other competing sources of information) of the future California climate and hydrology.** **The idea and issues are timely. An investment into a new model to push the CALFED (and, in general, climate−water agenda for California), in my view, may be a bit premature.** **Itemized set of concerns are provided in other sections of this review.**
Rating	**good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The question of understanding and appreciation of existing knowledge is central to my concerns.** **Integrated models clearly promise a one−stop analysis and assessment tool for questions such as ecosystems vulnerability and water−supply reliability. The other important aspects to the usability and reliability of such models are: 1. Quantification of uncertainties with respect to inputs/forcings, model parametrizations and represented scales etc. 2. Sensitivity of model response to the uncertainties, relative to spatial and temporal scales.** **These are central issues for any of the science knowledge to appropriately translate into policy and decision context. Points 1 and 2 have not been clearly understood even in the climate change model outputs, hydrologic models, and ecosystems processes.** **My view is that some very focused questions need to be asked first. For instance, what is the uncertainty cascade that will propogate through the following strand of the integrated model: Global Climate Model Temperature (200−300km scale resolution)−−>Downscaling to a mountainous watershed snowpack (5−10 km) −−−> Point Temperature Index Model for**

	Melt ---> Recharge/discharge dynamics to stream ---> Stream Flow Volume + Downscaled Air Temperature ---> Derived Stream Temperature. **At each step there are significant uncertainties and unresolved physics. One could pick just one component, temperature index snowmelt model and critically evaluate the significant errors and uncertainties that result in the melt estimates that are not modeling the full radiative balance. How it amplifies the uncertainty in the flow volumes and stream temperatures is not at all clear.** **Short of understanding and deriving the conditional distribution of hydroclimatic shifts and uncertainties, there is really very limited confidence in what can be learned from models that subsume various sources of uncertainty and produce an aggregate distribution of target variables--the very basis for decision strategies that are based on adaptive management suffer in the end.** **The PIs discuss some of these issues, for instance, integrating the Delta hydrodnamics into the modeling framework is fraught with unknowns and is much like throwing a bunch of uncertain distributions together and expecting the final distribution to be the one that wins out (due to most sensitive, mostly linear, response). The ongoing IPCC Assessment models are somewhat better suited to make a determination of the signal/noise and spatial details of climate change. I support the PIs view**

	that "pluralistic" approaches are needed. Projects of this variety need to start from sub−models and do an ensemble, multi−model study of the uncertainties, sensitivities on a subsystem basis, before launching into integration work.
Rating	**good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**See comments above.** **In my view, the question regarding new knowledge for a CALFED−style program needs to be "usable knowledge." Can a decision maker look at WEAP model output, understand the uncertainties, weigh the relative contribution of sources of forcing (climate) vs. model, scale uncertainty and act−−my answer would be negative.** **A realistic and deliberate view of this work would be to first learn lessons from the existing set of models and system submodels (GCM, ecosystem, hydrologic).**
Rating	**good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	

	Grasping the uncertainties is the central issue...otherwise, as the PIs preempt, yet another model is not particularly good "usable knowledge" in the decision and policy debate in the face of climate change.
Rating	**good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**not applicable**
Rating	**not applicable**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**See comments above, my concerns regarding the new modeling building exercise.** **Intrepretation for ecosytems impact/repsonse is not quite clear. Multi−model assessment would be useful,**
Rating	**good**

Additional Comments

Comments

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	excellent
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	Quite reasonable.
Rating	excellent

Overall

Provide a brief explanation of your summary rating.

Comments	The idea of building an integrated model that takes climate inputs, puts together various component models, and provides a seamless description is a good one. The need to understand the complex, climate, hydrologic, ecosystems interactions and response is central to the future California water resources planning and operations. In-stream aspects are very important (to understand and model). The scope of this project appears to focus on the climate-hydrology-infrastructure, with somewhat limited focus on the ecosystems dynamics and response. I think that is quite good and consistent with the budget and a 3-year project period. As discussed above, some key concerns stem from: 1. Usefulness and usability of an integrated model, wherein limited quantification of uncertainties and sensitivity of the submodels and inputs exists. 2. Given the other modeling systems

	in–place, much can be learned by re–tooling the existing set of models and driving their hydrology by new climate model data––with the view to understand and quantify, how uncertain input distributions, uncertainties from climate scenarios, downscaling teachniques, model specifications (regression equations, point models, such as temperature index snowmelt model, groundwater recharge models––where limited or no ground truth may exist) translate into systems vulnerability and reliability. 3. Generating usable knowledge is a central issue for programs like CALFED, wherein the import of adaptive management has been clearly articulated and acknowledged. As a result, the process of deliberating and framing policies based on model results needs to factor in the sources of uncertainties, and the relative role of the uncertain, unknown, and unknowable pieces of the system dynamics and evolution. This is a tall order, however, in my view, a starting point for model building is to grasp uncertainties and assumptions (and their impact of target variables) with submodels and with existing set of models.
Rating	**good**

Technical Review #2

proposal title: Climate Change Impacts on Water Operations and Ecological Processes in California

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**The goals of this study are to focus on two CALFED problem areas, ecosystem quality and water supply reliability. All goals, objectives and hypotheses of this proposed study are clearly stated and without apparent inconsistancies within the document. I find this proposed study to be extremely well−written and very timely, relevant, and important to the region.**
Rating	**excellent**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The proposed study builds upon an existing model for the Sacramento Valley watershed using the WEAP framework. In addition to expanding the geographic range to include the Delta and Central Valley river systems the proposed work will include a means of estimating changes to river water temperatures, which will be critical to ecosystem function and specifically salmonid resources in these systems. The proposed study is very well justified and should be placed as a very high priority for funding in 2005.**
Rating	

	excellent

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The approach described in this proposal is certainly the best available for examining the defined problem. It will provide a unique means of evaluating trade−offs in water resource use and management and potential impacts to the ecosystem. THe output will be critical to proactive management of water and biological resources in the region for decision makers.**
Rating	**excellent**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**The co−investigative team selected for this study is top−notch. I have comiplete confidence that this unique interdisciplinary team has all the tools needed to successfully implement the study.**
Rating	**excellent**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	
Rating	

	not applicable

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	One of the strengths of this proposal is that it provides a modeling framework against which countless management actions or scenarios can be simulated and evaluated with relevant biological and resource needs considered. Managers need only place "value" on the relevant outcomes to evaluate possible management scenarios for water resources under the climate warming scenarios.
Rating	excellent

Additional Comments

Comments	This is a very strong proposal and one that I would suggest should receive serious consideration for funding.

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	An outstanding research team has been assembled for this study. They collectively are renowned researchers with a strong past record of research productivity.
Rating	excellent

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**Budget appears well within expectations for academia.**
Rating	**excellent**

Overall

Provide a brief explanation of your summary rating.

Comments	**Review of this proposal was truly a pleasure. It is extremely well-justified, well written, timely, relevant and needed. I look forward to seeing the outcomes of this proposed research as I feel the approach certainly has merit in other areas of the world that will experience water shortages in the future.**
Rating	**excellent**

Technical Review #3

proposal title: Climate Change Impacts on Water Operations and Ecological Processes in California

Review Form

Goals

Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the idea timely and important?

Comments	**Goals, objectives are clearly stated. Limited hypothesis testing. Modeling goals and approaches are consistent with budget, timing and expertise. Ecosystem based objectives are much less well defined, although clearly identified as a high priority.** **The proposal is timely and fundamentally important to water use in the Central Valley. I am not clear what role the proposed modeling approaches will have in decision making and conflict resolution processes. The proposed extension and research tie to salmonid life history and production, species at risk and climate change adaptation is tenuous.**
Rating	**good**

Justification

Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full−scale implementation project justified?

Comments	**The proposed work is sound and reflects and extends existing knowledge. The proposed modeling methods and calibration and the link to economic and climate change models is well developed in this proposal. The extension of past the WEAP Sacramento valley model to**

	the entire Central Valley appears warranted. **As above, the link to ecosystem function as indexed by salmonid production in various stream reaches is not the emphasis of this proposed work, but is defined as one of its priorities. The justification for the use of this approach may be important, but is not realistically reflected in budgets, activities or expertise.** **Extension to adaptation strategies from the modeling tasks in the proposal is also unclear. Adaptation to climate change is a well documented (IPCC) approach and often involves considerable stakeholder input (Vulnerability Approach). Adaptation is social and is be delivered at local (stakeholder) levels. How will this be performed? Given budgets and time, the proposal team will develop a number of scenarios for test against the model function and create alternatives which might be suggested as adaptation options. As the IPCC and extensive consultations across North America suggest, a strictly science based top−down approach for adaptation to climate change may not be as effective as the alternative stakeholder involvement process advocated in the climate change literature.**
Rating	**good**

Approach

Is the approach well designed and appropriate for meeting the objectives of the project? Is the approach feasible? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology, or approaches? Will the information ultimately be useful to decision makers?

Comments	**The modeling approach and downscaling climate scenario approaches appear sound and follows extensive work and experience by the proponents.**

	However, little insight is given in the proposal on the approach used to connect model output to salmon life history and production. The proposal indicates it will look at the "viability" of key at−risk salmonids; minimum in stream flow requirements for salmonids; ecological indices − water temperature, salmonid population), salmonid habitat. I recognize that the proposal's emphasis will be on water temperature, flow, rainfall − runoff characterstistics, but the ecological tie to salmonids as an indicator is not well developed in the proposal, but stated clearly as a key objective. **As also state above.. the climate change adaptation approach is not well developed. there is extensive literature on adaptation and water issues. i.e. Cohen, S., D. Neilsen and R. Welbourn (eds.). 2004. "Expanding the Dialogue on Climate Change and Water Management in the Okanagan Basin, British Columbia". Environment Canada, Agriculture &Agri−Food Canada and University of British Columbia. 230pp.**
Rating	**very good**

Feasibility

Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives and within the grasp of authors?

Comments	**the methodological approaches for modeling, downscaling climate scenarios are technically feasible and follow extensive work and experience by the proponents of this proposal. Given their experience in the Sacramento Valley, the extension of this model to the Central Valley will provide interesting results and potentially effective prediction for the region.** **There are limitations in the proposal associated with salmonids as an ecological index, and the approach to build adaptation strategies. Both these components of the proposal do not reflect the existing science and**

	potentially the experience of the proposal authors.
Rating	**very good**

Monitoring

If applicable, is monitoring appropriately designed (pre−post comparisons; treatment−control comparisons)? Are there plans to interpret monitoring data or otherwise develop information?

Comments	**The proposal suggests that model function and output will be validated through a series of workshops and calibration comparisons between other models. These approaches for calibrating the model and its output appear consistent with the experience of the authors and the science and experience of water resource models based in the region and in North America.**
Rating	**good**

Products

Are products of value likely from the project? Are contributions to larger data management systems relevant and considered? Are interpretive (or interpretable) outcomes likely from the project?

Comments	**Tasks 1 to 5 are likely to produce excellent well formed deliverables and products. From an external review perspective, it is not clear what products will be incorporated and used through the existing water management in the Central Valley. Will the model be web based.... what other communication tools will be used to disseminate the results and experience from the proposed work to what audience? How will the results and model products be incorporated into existing CALFED discussions and management functions?**
Rating	**good**

Additional Comments

Comments	**The proposed modeling ideas, tasks and approaches relative to existing models and work, and climate change downscaling are sound and should be considered for funding.** **The team appears interested in making an extension into areas of climate change adaptation and ecosystem function. It is not completely clear in the proposal how they will do this.** **There appears to be limited experience in dealing with issues of climate change risk, vulnerability and adaptation (IPCC 2001). Adaptation and therefore water use in this region will be conflict driven in the future. How will the model adaptation strategies be used to help resolve some of these debates?** **i.e. some work is being conducted in the Columbia Basin – Cohen et al. 2004. Expanding the Dialogue on Climate Change and Water Management in the Okanagan Basin, British Columbia. and also http://www.cses.washington.edu/cig/res/res.shtml** **How will the model outputs and scenarios be connected to salmonid life history and production? What are the impact and adaptation responses to salmonid populations (survival – production) and behaviour to climate variation and change?**

Capabilities

What is the track record of authors in terms of past performance? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Comments	**UCB and the team links are excellent. The team is well connected to other agencies, institutions and appears linked into the existing water and climate work in the region and to the Calfornia Bay Delta Authority.**

Rating	**excellent**

Budget

Is the budget reasonable and adequate for the work proposed?

Comments	**The budget is reasonable and adequate to meet the modeling portions of the proposal. Given the budget details presented, the proposal over states the nature and extent of tasks 5 and 6 (i.e. ecosystems / environment context; adaptation options and approaches).**
Rating	**very good**

Overall

Provide a brief explanation of your summary rating.

Comments	**The proposal reflects extensive experience by the author team and will create a well developed model product and output. The extension in the proposal to ecological indices (salmonids), and climate change adaptation needs to be improved. To make these extensions, the team should integrate fisheries and social scientists into their team.**
Rating	**very good**